(12) UK Patent Application (19) GB (11) 2 187 325 (13) A

(43) Application published 3 Sep 1987

(21) Application No 8700763

(22) Date of filing 14 Jan 1987

(30) Priority data

(31) 61/007240	(32) 17 Jan 1986	(33) JP
61/007241	17 Jan 1986	
61/067663	26 Mar 1986	
61/067664	26 Mar 1986	
61/067665	26 Mar 1986	
61/067666	26 Mar 1986	
61/067667	26 Mar 1986	
61/067668	26 Mar 1986	

(51) INT CL⁴
G11B 33/12 33/08

(52) Domestic classification (Edition I):
G5R B15 B434 B43X

(56) Documents cited
GB A 2074359 EP A2 0185140

(58) Field of search
G5R
Selected US specifications from IPC sub-class G11B

(71) Applicant
Mitsubishi Denki Kabushiki Kaisha

(Incorporated in Japan)

2–3 Marunouchi 2-chome, Chiyoda-ku, Tokyo, Japan

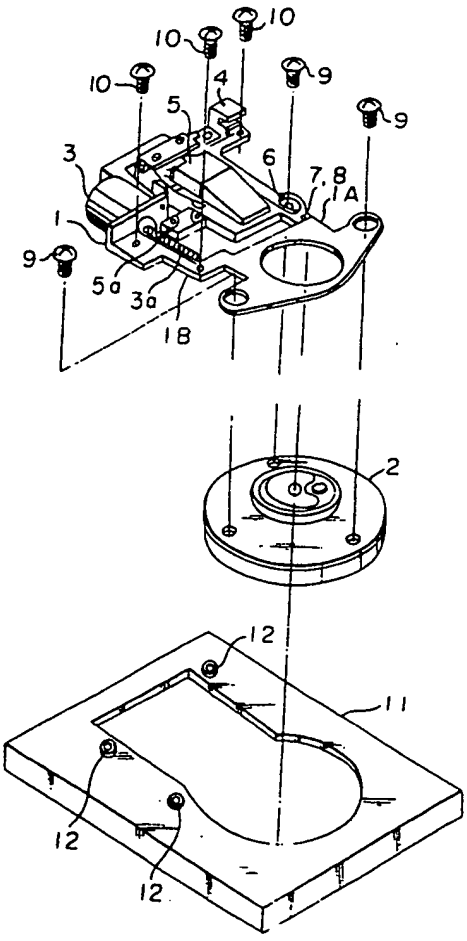
(72) Inventor
Toshimasa Naruki

(74) Agent and/or Address for Service
Carpmaels & Ransford,
43 Bloomsbury Square, London WC1A 2RA

(54) Recording and reproducing disc driving apparatus

(57) A recording and reproducing disc driving apparatus has a main base 1 which has seat portions for supporting a head carriage 5, a carriage drive motor 3, a disc rotating motor 2 and a sensor 4 and has at least one cut away portion 1A, 1B, and a sub-base 11 for fixedly mounting the main base and having a dimension of the top surface which is the same as that of a given rectangular outer configuration of the driving apparatus. The at least one cut away portion is formed by removing a portion of the main base which does not contribute to support elements such as motors etc so that the top surface of the main base is made smaller than that of the given rectangular outer configuration of the apparatus. Only the main base 1 need be accurately manufactured. Bolts 10 for connecting the main base to the sub-base may have cushion members 12 to absorb vibrations.

FIGURE 2

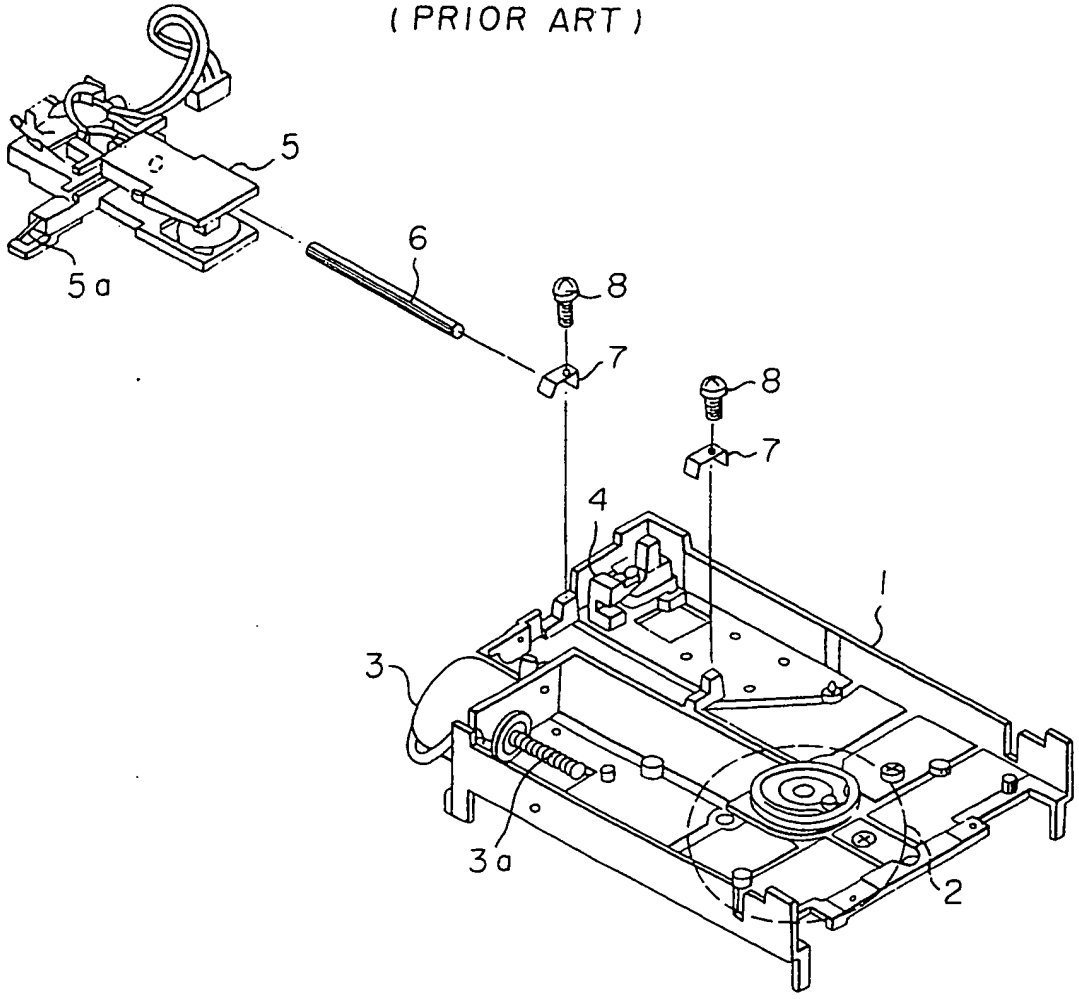


GB 2 187 325 A

2187325

FIGURE 1

(PRIOR ART)



2137325

FIGURE 2

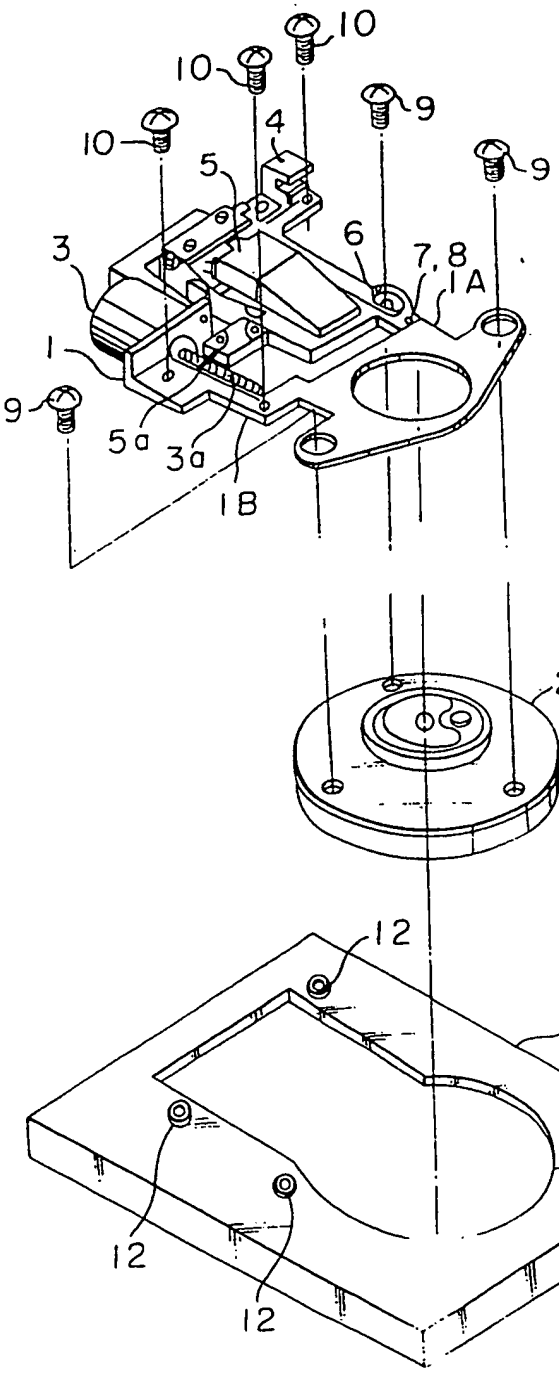
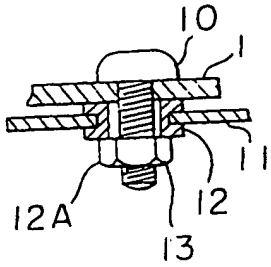
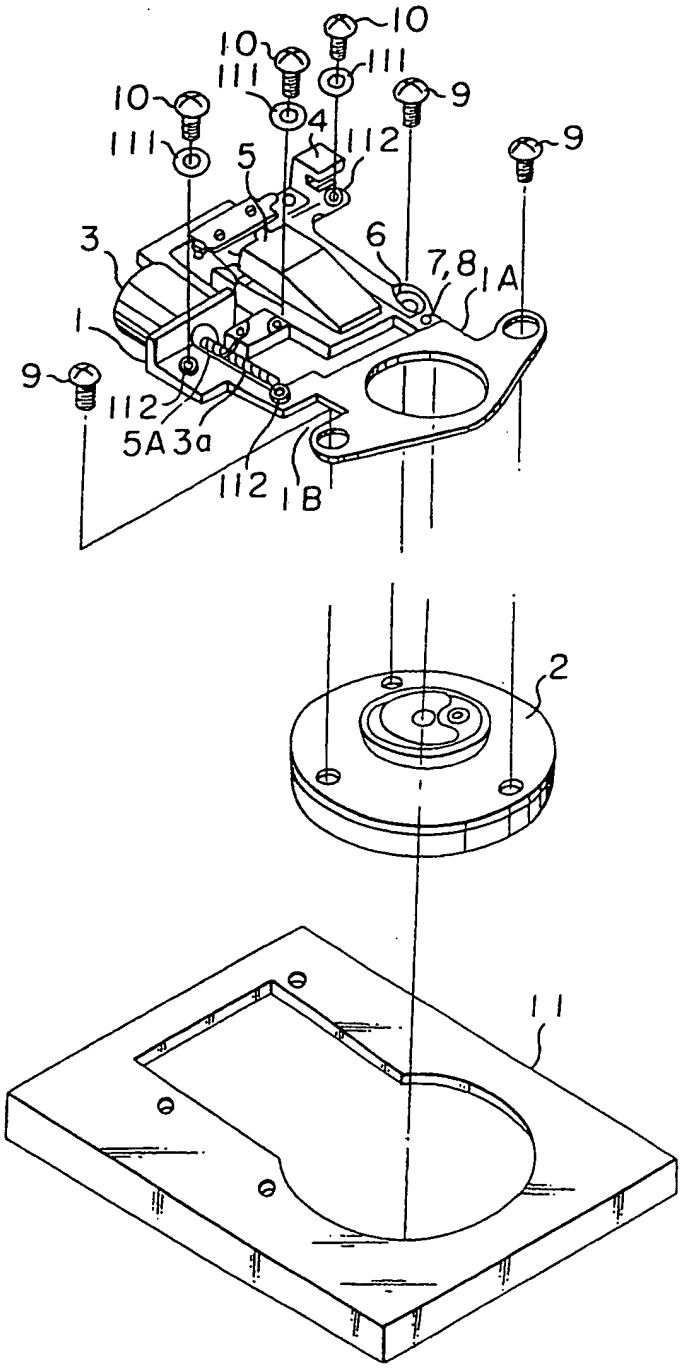


FIGURE 3



2187325

FIGURE 4



2187325

FIGURE 6

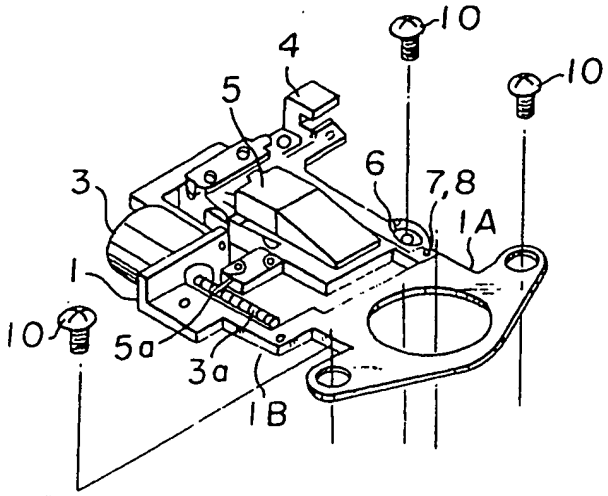
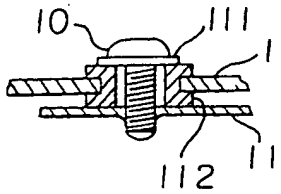


FIGURE 5



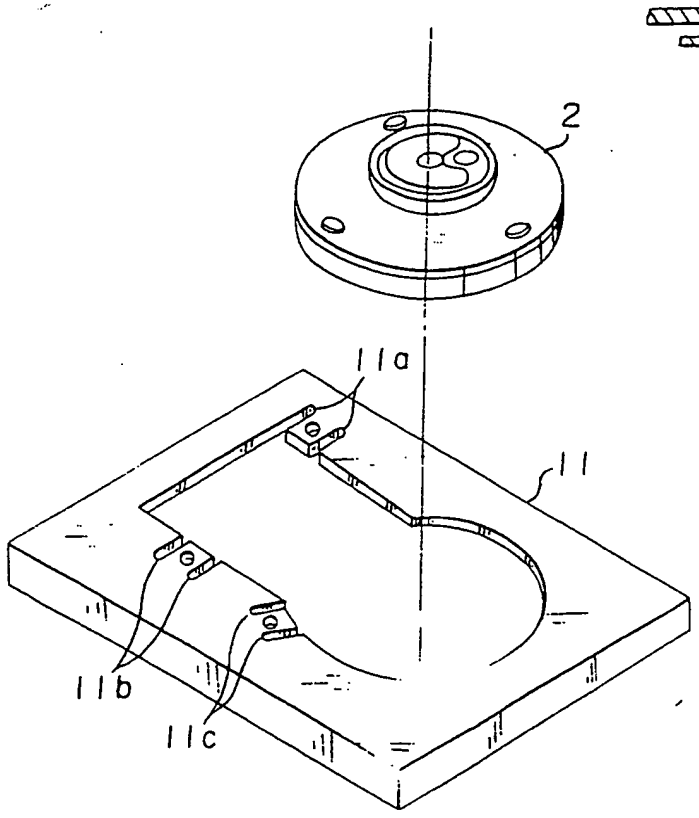


FIGURE 7

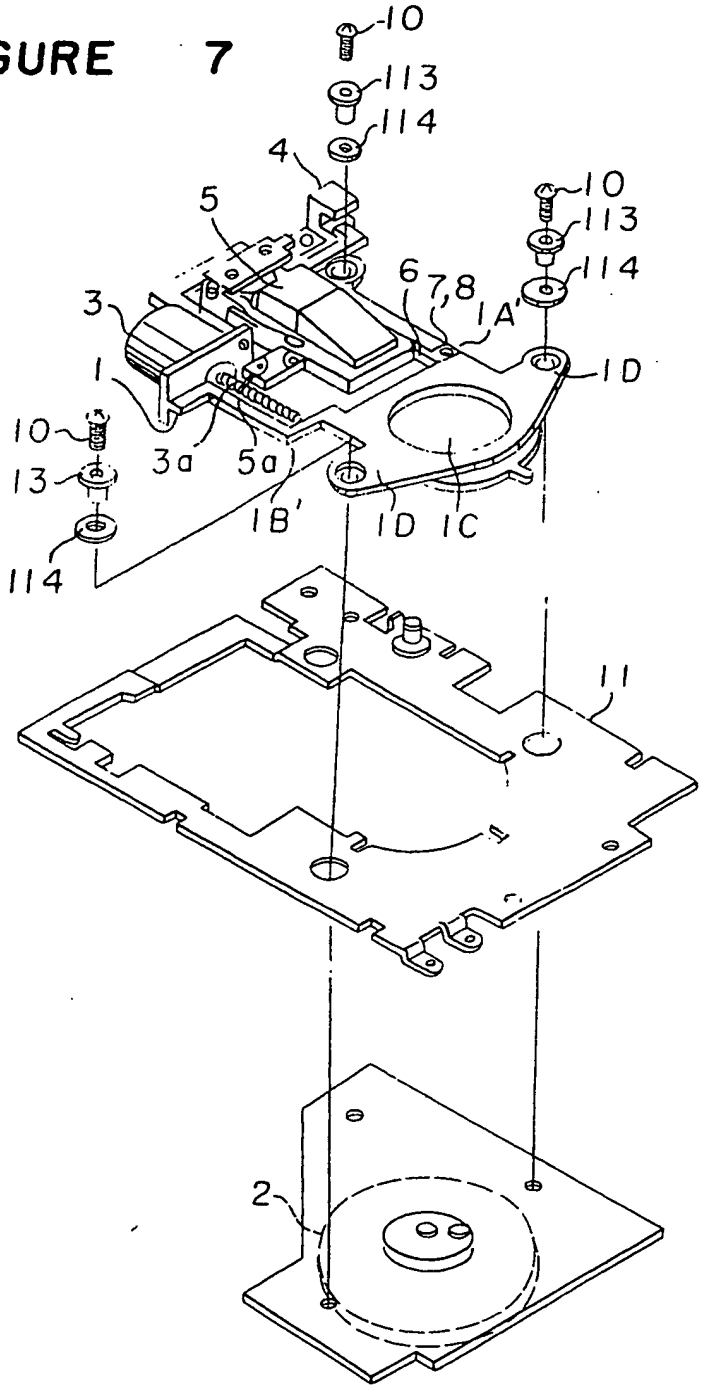
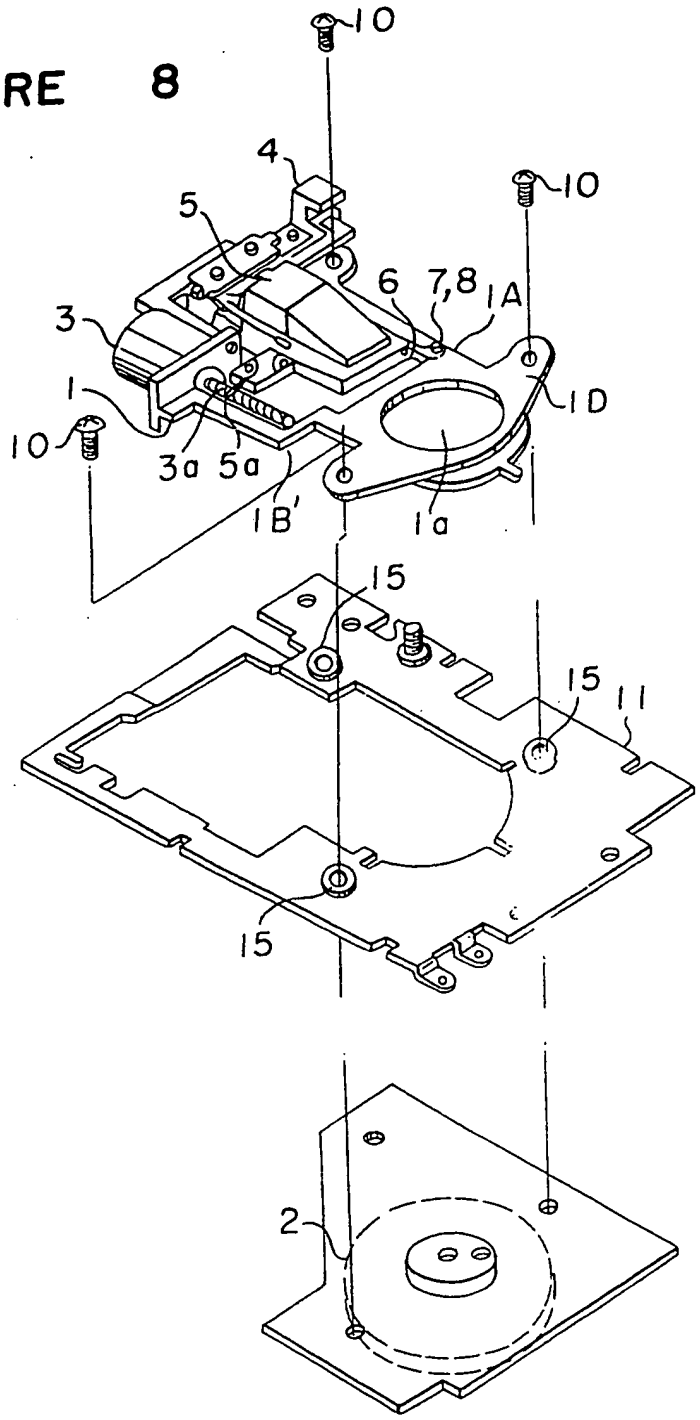


FIGURE 8



2187325

FIGURE 9

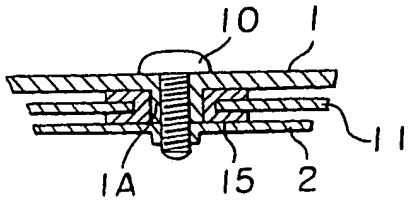


FIGURE 10

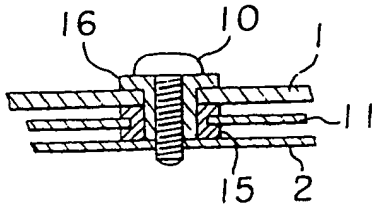
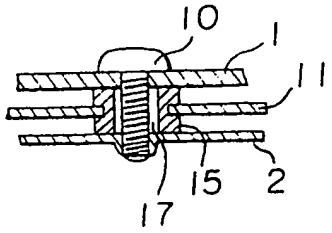


FIGURE 11



SPECIFICATION

Recording and reproducing disc driving apparatus

The present invention relates to a recording and reproducing disc driving apparatus.

Figure 1 is an exploded perspective view showing an important part of a conventional magnetically recording and reproducing disc driving apparatus. In Figure 1, a reference numeral 1 designates a main base whose area of the top surface has the same dimension as that in projection of the main body of the conventional recording and reproducing disc driving apparatus. The main base 1 supports a disc driving motor 2 (shown by a dotted line) for rotating the magnetic disc medium, a stepping motor 3 for moving a head (not shown), a sensor 4 such as a TK00 sensor for determining the position of the head, and so on. Both ends of a guide rod 6 are fixed to the main base 1 by means of two pairs of clamps 7 and bolts 8. A head carriage 5 is slidably mounted on the guide rod 6. The head carriage 5 has an extension 5a which is engaged with a screw shaft 3a connected to a stepping motor 3 so that the head carriage 5 is stepwisely moved by the rotation of the stepping motor 3.

In recent years, the recording and reproducing disc driving apparatuses become more and more small and thin, and at the same time, the capacity of the memory becomes large. On the other hand, the magnetic characteristics of a magnetic disc medium is improved to have a high performance and high density. With the improvement of the magnetic disc medium, demands of the recording and reproducing disc driving apparatus having a high track pitch and highly accurate dimensions increase, while the low manufacturing cost is required.

The magnetic disc medium is prepared by coating a magnetic layer at a thickness of about 1mm-1.3mm on the surface of a base film. The magnetic disc medium expands and contracts due to change in temperature and moisture. In order to follow such change, the main base 1 as an element of the recording and reproducing disc driving apparatus has been formed by die-casting aluminum and has been subject to fine processing (the aluminum die-cast material has substantially same thermal expansion coefficient as the magnetic disc medium). Accordingly, the manufacturing cost for the main base is very expensive. Further, the disc driving motor 2 should be accurate so as to rotate the magnetic disc medium without misalignment of the axial center. Similarly, selection of material and improvement in accuracy of machining should be considered for the stepping motor 3, the head carriage 5 and the guide rod 6 which are elements for determining the position of the head.

In the conventional recording and reproducing disc driving apparatus having the construction as above-mentioned, the main base 1 is formed to have the substantially same dimension of the top surface as the surface area of the conventional apparatus when it is viewed from the top. Accordingly, it has been difficult to manufacture the main base of a small size, small weight and a low manufacturing cost. The conventional main base has a rectangular shape, and the size of the top surface is substantially same as the size of the recording and reproducing disc driving unit when viewed from the top. The main base is similar to the main frame 22 disclosed in Figures 1 and 3 of USP 4205355, the housing 32 as shown in Figure 5 of USP 4415940, and the chassis 103 as shown in Figures 9 and 10 of USP 4417289. Namely, the main base has a one-piece structure including element bearing parts as well as portions unnecessary to support the elements. Accordingly, it has been difficult to form a main frame of a small size and weight.

Further, major elements constituting a disc driving unit are mounted on the main base 1 which has been finely finished. As described before, since the dimension in projection from the top of the main base 1 is substantially same as that of the main body of the recording and reproducing disc driving apparatus, hence, the weight of the main base is greater, it has been not easy to handle and carry it and much time is needed for assembling work.

It is an object of the present invention to provide a recording and reproducing disc driving apparatus which is small in size, small in weight and is of a low manufacturing cost.

It is an object of the present invention to provide a recording and reproducing disc driving apparatus which shortens time for assembling work and is economical.

The recording and reproducing disc driving apparatus of the present invention is constructed in such a manner that a surface area in projection from the top is made small and compact by cutting at least one portion of the base which does not contribute to mount elements such as a motor constituting a disc driving unit while leaving portions which contribute for mounting the elements.

On the main base which is finely finished and has the minumum dimensional area in projection and compact configuration, mounted are the major elements such as a stepping motor for moving a head, a head carriage for moving the head stepwisely by the rotation of the stepping motor, a sensor to determine the position of the head, a disc driving motor for rotating a disc, and so on, all of which should have accuracy in dimension. The main base on which the elements are supported is fixed to a sub-base whose top surface area is substantially same as that of the driving apparatus

main body. The sub-base is finished in relatively rough.

In the drawings;

Figure 1 is an exploded perspective view showing only important parts of a conventional recording and reproducing disc driving apparatus;

Figure 2 is an exploded perspective view showing only important parts of an embodiment of the recording and reproducing disc driving apparatus according to the present invention;

Figure 3 is a cross-sectional view showing a structure for connecting a main base and a sub-base shown in Figure 2;

Figure 4 is an perspective view, similar to Figure 2, of a second embodiment according to the present invention;

Figure 5 is a cross-sectional view showing a structure for connecting the main base to the sub-base of the second embodiment;

Figure 6 is a perspective view, similar to Figures 2 and 4, of a third embodiment of the present invention;

Figure 7 is a perspective view, similar to Figures 2 and 4 and 6, of a fourth embodiment of the present invention;

Figure 8 is a perspective view, similar to Figures 2 and 4, 6 and 7, of a fifth embodiment of the present invention;

Figure 9 is a cross-sectional view showing a structure for connecting the main base to the sub-base of the fifth embodiment;

Figure 10 is a cross-sectional view showing a structure for connecting the main base to the sub-base as shown in Figure 8; and

Figure 11 is a cross-sectional view showing a shock absorbing member with a spacer which connects the main base, the sub-base and a driving motor.

In the following, preferred embodiments of the present invention will be described with reference to the drawings.

In the recording and reproducing disc driving apparatus of the present invention, the main base is so formed that it has the minimum dimension and volume in which the major elements are attached, and it is finely finished. Thus formed small-sized main base reduces the size of the driving aparatus as a whole. Performance of the driving apparatus is determined by the assembly including the small-sized main base.

The sub-base may have the substantially same dimension, in projection from the top, as the apparatus main body, and may not be subject to fine processing.

Further, the structural elements which are not required to be finely finished, unlike those mounted on the main base, may be attached to the sub-base.

Figure 2 is an exploded perspective view showing important parts of the first embodiment of the recording and reproducing disc driving apparatus according to the present invention.

In Figure 2, a reference numeral 1 designates a main base formed, for instance, by die-casting aluminum so that it has accurate dimensions and a reduced surface area. Namely, cut portions 1A, 1B which do not contribute to mount structural elements for driving a disc, such as a disc driving motor, a stepping motor, a sensor, a head carriage, a guide rod, a clamp and so on, are removed from the main base by cutting so that the main base 1 have the minimum surface area.

The cut portions 1A, 1B are formed in the main base in such a manner that they extend near portions where bolts are inserted to connect the main base to a sub-base 11 and portions where bolts are inserted to secure the disc driving motor 2. The cut portions 1A, 1B substantially reduces the weight and the surface area of the main base.

On the main base 1, a stepping motor for moving a head (not shown), a head carriage 5 stepwisely moved by the rotation of the stepping motor 3, a sensor 4 such as a TK00 sensor for detecting the position of the head, and so on are mounted. Further, both ends of a guide rod 6 carrying the head carriage 5 are fixed to the main base 1 by means of two pairs of clamps 7 and bolts 8 so that the head carriage 5 is freely movable along the guide rod 6. An extension 5a projecting from a side of the head carriage 5 is engaged with a screw shaft 3a of the stepping motor 3. The rotation of the stepping motor 3 stepwisely moves the head carriage 5. The disc driving motor 2 for rotating a magnetic disc medium (not shown) is attached to the main base 1 by means of bolts 9.

In the recording and reproducing disc driving apparatus of the present invention, the major elements for driving the disc are concentratedly mounted on the main base 1 which is formed into thin and small size, and is precisely finished. The main base is fixed to the sub-base 11. The sub-base 11 is formed by pressing and punching a metal sheet or molding a synthetic resin to have the substantially same dimension in projection from the top as that of the driving apparatus main body, and is finished relatively rough.

Figure 3 shows detailedly a construction to connect the main base 1 to the sub-base 11. The main base 1 and sub-base 11 respectively have three engaging portions. At each of the engaging portions, there is provided a fastening means consisting of a cylindrical cushion member 12 with a spacer 12A, a bolt 10 and a nut 13. When the main base 1 and the sub-base 11 are assembled, the cylindrical cushion member 12 is attached to a hole formed in the sub-base 11 with its intermediate portion of the outer periherly firmly connected to the sub-base 11 so that a predetermined distance is kept between the lower surface of the main base 1 and the upper surface

of the sub-base 11. The spacer 12A is inserted in a through hole formed in the main base at a position corresponding to the through hole of the sub-base 11. The bolt 10 is put in the spacer 12A and the nut 13 is screwed into a threaded hole of the sub-base 11.

In the recording and reproducing disc driving apparatus having the above-mentioned construction, the main base which has to be accurately finished, can be formed to be a small size and at a low manufacturing cost. Further, since the major elements for driving the disc, such as the disc driving motor 2, the stepping motor 3, the sensor 4, the head carriage 5, the guide rod 6, etc. are mounted on the main base, adjustment of the elements after assembling can be easily done and high accuracy in the assembling is obtainable. In addition, time requiring for the adjusting work can be shortened. This is advantageous from an economical viewpoint.

The sub-base 11 may be formed by, for instance, pressing a metal plate or molding a synthetic resin. Since it is not required to have accurate dimensions, the construction is splitted into two parts, i.e. the main base 1 and the sub-base 11. The embodiment shown in Figure 2 is advantageous in view of manufacturing cost and assembling work in comparison with the conventional driving apparatus using the main base shown in Figure 1. Further, according to the present invention, the size of the driving apparatus can be made small.

In the embodiment, the main base 1 is formed by die-casting aluminum. However, the main base 1 and the sub-base 11 may be formed by pressing and cutting a metal sheet as far as a product formed by such operations have accurate dimensions. The sub-base 11 may be formed by molding a synthetic resin.

The cushion member is to control the transmission of vibrations between the main base 1 and the sub-base 11. The cushion member may be attached to the main base 1. Figure 4 shows an embodiment of the cushion member attached to the main base 1. Namely, a cushion member 112 with a spacer is firmly connected to an through hole formed in the main base 1 with the intermediate portion of the outer circumference firmly connected, at a position engageable with the sub-base 11.

As shown in Figure 5, the bolt 10 is put in the cushion member 112 with the spacer through a washer 111 so as to be engaged with a threaded hole formed in the sub-base 11. Figure 6 shows another embodiment of the fastening means for fastening the engaging portions between the main base 1 and the sub-base 11. The embodiment shown in Figure 6 is to eliminate disadvantages such that when the main base 1 is connected to the sub-base 11, there often causes misalignment between the through hole in the main base 1 and the through hole or the threaded hole formed in the sub-base because the sub-base 11 has relatively rough dimensions.

In the embodiment shown in Figure 6, each pair of slots 11a, 11b, 11c are formed adjacent the engaging portions of the sub-base 11 to provide tongue-shaped portions for the engaging portions. Accordingly, even though there is some deviation between the through holes in the main base 1 and the sub-base 11 in which the bolt is to be inserted, the tongue-shaped poritions formed by the slots 11a, 11b, 11c permit adjustment of the position of the through holes, with the result that the both bases are connectable by the bolt in an alignment condition of the holes. Accordingly, distortion of the main base 1 or the sub-base 11 which may be caused when they are connected by bolts, can be eliminated.

Figure 7 is an exploded perspective view of the fourth embodiment of the recording and reproducing disc driving apparatus of the present invention wherein the same reference numerals designate the same parts, and therefore, description of these parts is omitted.

In Figure 7, the main base 1 is constituted by a shaped product such as an aluminum die-cast product with highly accurate dimensions and the minimum area of the top surface. The main base 1 supports the stepping motor 3 for moving the head (not shown), the head carriage 5 moved stepwisely by the rotation of the stepping motor 3, the sensor 4 such as a TK00 sensor for detecting the position of the head etc.. The head carriage 5 is slidably mounted on the main base 1 through the guide rod 6, both ends of which are fixed to the main base by means of two pairs of the clamps 7 and the bolts 8. The extension 5a of the head carriage 5 is engaged with the screw shaft 3a of the stepping motor 3 so that the head carriage 5 is moved stepwisely by the rotation of the motor 3. Thus, the major elements for driving the disc are arranged on the small-sized main base 1 having a highly accurate dimensions.

A sheat 1C for fitting the disc driving motor 2 is formed in the main base 1. A pair of ear portions 1D, 1D are formed at both sides of the seat 1C for fixing the driving motor 2. On the other hand, the sub-base 11 is so formed that the area and configuration of the top surface is substantially same as those of the driving apparatus main body. The sub-base is assembled in a clamped state between the main base 1 and the disc driving motor. When assembling these members, a spacer 113 and a cushion member 114 are fitted into each of the through holes formed in the ear portions 1D, the spacer 113 and the cushion member 114 reaching the disc driving motor 2 through the aperture formed in the sub-base 11, followed by inserting the bolt 10 and screwing to the disc driving motor 2. In this embodiment, the cushion member 114 effec-

tively acts only on the sub-base 11 for damping shocks and vibrations.

Thus, in the fourth embodiment of the recording and reproducing disc driving apparatus, the main base 1 is formed as small as possible in the plan view, while is finished with high accuracy, and supports the major elements for driving the disc such as the stepping motor 3, the head carriage 5, the sensor 4 ect., all being required to have a accuracy. On the other hand, the sub-base 11 is formed into a substantially same dimension in the plan view with respect to the driving apparatus main body. The sub-base 11 is assembled between the main base 1 and the disc driving motor 2 by means of the bolts 10, the spacers 113 and the cushion members 114. Accordingly, the configuration of the assembly can be smaller than the conventional one, and the vibrations and shocks imparted from the outside of the apparatus can be effectively reduced by the cushion members 114. The number of through holes for inserting the bolts can be reduced to a half because common bolt insertion holes are formed in the main base 1 to connect the disc driving motor 2 to the main base 1 and to connect the sub-base 11 to the main base 1. When comparing the embodiments shown in Figures 6 and 7 with the embodiments shown in Figures 2 and 4, the former embodiments eleminate three bolt insertion holes among six bolt insertion holes which are used for connecting the disc driving motor 2 and the sub-base 11 to the main base 1 respectivey. Accordingly, the third and fourth embodiments have wider cut portions 1A', 1b'. As a result, the shape of the top surface of the main base 1 is further reduced, whereby the weight and volume of the driving apparatus can be further reduced.

In the fourth embodiment in which the sub-base 11 is held between the disc driving motor 2 and the main base 1, the cushion members may be attached to the sub-base.

Figure 8 shows the fifth embodiment of the present invention.

In Figure 8, the disc driving motor 2 is fixed to the main base 1 by inserting the bolts into through holes formed in the ear portions 1D, 1D of the main base 1, Figure 9 is a cross-sectional view showing the fastening means for connecting the main base 1 and the disc driving motor 2 by interposing the sub-base 11 therebetween. The fastening means comprises a cushion member 15, a cylindrical spacer 1A, which may be formed integrally with the main base 1 and which determines the distance between the main base 1 and the disc driving motor 2, and a bolt 10. The cushion member 15 is disposed around the spacer 1A, and holes the sub-base 11 between the main base 1 and the motor 2 to thereby damp the vibrations and shocks imparted to the sub-base 11.

Figure 10 is a cross-sectional view of another embodiment of the fastening and damping means. The construction of the fastening means is the same as that of shown in Figure 9 provided that a spacer 16 for determining the distance between the main base 1 and the disc driving motor 2 is separated from the main base 1. The fastening means shown in Figure 10 realizes fixture of the members to be connected at a proper positional relationship and the function of damping.

The same function can be obtained by another embodiment as shown in Figure 11 in which a spacer 17 is fixed to the inner wall of the cushion member 15.

As described above, in the recording and reproducing disc driving apparatus according to the present invention, the main base is so formed that at least one portion which does not contribute to support the structural element is eliminated to reduce the surface area of the top surface and is finished with a high accuracy, which supports the stepping motor, the head carriage, the sensor, the disc driving motor etc.. The main base is connected to the sub-base having substantially same configuration in view from the top as the driving apparatus main body, the sub-base is not required to finish accurately. Accordingly, miniaturization, reduction in weight and manufacturing cost of the driving apparatus can be realized and adjustment in the assembling works can be easy. Further, time for adjusting in the assembling work can be shortened to improve the efficiency of the assembling. In addition, the small-sized main base reduces the manufacturing cost.

The fastening means for connecting the main base and the sub-base damps the vibrations and shocks imparted from the outside of the driving apparatus, whereby performance of the driving apparatus is improved.

CLAIMS

1. A recording and reproducing disc driving apparatus comprising:

a head placed opposing a data recording and reproducing disc,

a carriage for supporting said head,

a first motor for driving said carriage so that said head is moved to a desired position with respect to said disc,

a sensor to detect that said disc is correctly moved to the desired position, and

a second motor for rotating said disc, said apparatus being formed in a given rectangular outer configuration, characterized by comprising:

a) a main base having seat portions for supporting said head, carriage, first and second motors and sensor, and having at least one cut portion which is formed by cutting a portion of the main base which does not contribute to support said members so that the surface area in projection from the top of said

main base is made smaller than that of said given rectangular configuration of the apparatus, and

b) a sub-base for fixedly mounting said main base and which has the same dimension as the surface area of said given rectangular configuration of the apparatus.

2. The recording and reproducing disc driving apparatus according to Claim 1, wherein said main base has a plurality of engaging portions at its outer periphery which are engageable with a plurality of fastening means for connecting said main base to said sub-base, and said cut portion extends near said engaging portions, but leaves them in said main base.

3. The recording and reproducing disc driving apparatus according to Claim 2, wherein a shock absorbing means is placed at each of the engaging portions for connecting said main base to said sub-base to thereby control vibrations between said main base and said sub-base.

4. The recording and reproducing disc driving apparatus according to Claim 3, wherein slots are formed near each of said engaging portions formed in said sub-base so that displacement in position of said engaging portions is allowed.

5. The recording and reproducing disc driving apparatus according to Claim 4, wherein said slots are paired and formed at both sides of each of said engaging portions to provide a tongue-shaped engaging portions.

6. The recording and reproducing disc driving apparatus according to Claim 1, wherein said sub-base is held between said main base and said second motor attached to said main base.

7. The recording and reproducing disc driving apparatus according to Claim 6, wherein said second motor is connected to said main base through a plurality of fastening means, and said sub-base is held between said main base and said second motor by said fastening means.

8. The recording and reproducing disc driving apparatus according to Claim 7, wherein a shock absorbing means is provided in each of said fastening means to control vibrations between said main base and said sub-base.

9. The recording and reproducing disc driving apparatus according to Claim 7, wherein a spacer is provided in each of said fastening means to keep the distance between said main base and said second motor at a given value.

10. The recording and reproducing disc driving apparatus according to Claim 7, wherein said sub-base is formed by pressing and punching a metal sheet.

11. The recording and reproducing disc driving apparatus according to Claim 1, wherein said sub-base is formed by casting metal or by molding a resinous material.

12. A recording and reproducing disc driving apparatus substantially as hereinbefore described with reference to any one of the drawings.

Printed for Her Majesty's Stationery Office
by Burgess & Son (Abingdon) Ltd, Dd 8991685, 1987.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.